CLAIMS

What is claimed is:

1. An improved method for enhancing immune responses by upregulating co-stimulatory molecules, the upregulating of the co-stimulatory molecules comprising the steps of administering a glucan-containing composition to an animal or a human, in sufficient dosage to cause an enhanced expression of co-stimulatory molecules on antigen presenting cells, the co-stimulatory molecules providing a second signal to T lymphocytes, causing the T lymphocytes to differentiate into armed effector cells.

2. The improved method of Claim 1 wherein the glucan-containing composition is at minimum a portion of a glucan selected from the group consisting of β 1,3-glucans and β 1,6-glucans.

3. The improved method of Claim 1 wherein the molecule expressed is a molecule from a family of B7 molecules.

4. The improved method of Claim 5 wherein the family of B7 molecules comprises a molecule selected from the group including B7.1, B7.2, and B7.3.

5. A method for expressing an increased number of B7 molecules on the surface of an antigen presenting cell to more efficiently potentiate the immune system comprising the steps of:

obtaining an upregulating agent;

administering the upregulating agent to an organism; and,

allowing an upregulation of B7 molecules on a cell whereby an expression of the B7 molecules allows reaction with an effector cell, the reaction with the armed effector cell potentiating an immune response.

6. An enhanced macrophage enhanced by immunological response modification, the macrophage enhancing immunological response, comprising a macrophage enhanced by the delivery of a necessary signal that augments an upregulation of a costimulatory molecule, the enhanced upregulation of the costimulatory molecule, in part, caused by a first glucan containing composition interacting with a second glucan containing composition.

7. The macrophage of Claim 6 wherein the costimulatory molecule is a B7 molecule.

8. The macrophage of Claim 7 wherein the B7 molecule is selected from a group comprising B7.1, B7.2 and B7.3.

9. A beta-glucan preparation which provides a free amino group for conjugation and which can be used as a vaccine adjuvant, comprising:

microparticulate beta -(1,3)-glucan with or without beta -(1,6)-glucan side chains which do not substantially reaggregate upon drying or rehydration;

about 1-10 % by weight partially deacetylated N-acetylglucosamine within said beta-glucan that provides a free amino group for vaccine conjugation; and

a vaccine or an antigenic substance, wherein said vaccine or antigenic substance is conjugated with said free amino group.

10. The preparation of Claim 9, wherein the glucan contains about 1 %-10% by weight chitin or partially deacetylated N-acetylglucosamine.

11. A method of using microparticulate beta -(1,3)-glucan as a vaccine adjuvant comprising the steps of:

preparing or obtaining a microparticulate beta -(1,3)-glucan composition which does not substantially reaggregate upon drying and rehydration which contains partially deacetylated N-acetlyglucosamine with a free amino group;

suspending the microparticulate beta -(1,3)-glucan composition in liquid;

adding at least one vaccine or antigenic substance;

conjugating the vaccine onto the free amino group; and

administering the vaccine to an animal or human.

12. The method of Claim 11, wherein the glucan contains less than 5% by weight protein and lipid, more than 85% by weight glucose, and about 1-10% by weight chitin or partially deacetylated N-acetylglucosamine.

13. A vaccine adjuvant which contains microparticulate beta glucan with a free amino group, which enhances the immunologic effects of vaccine or antigenic substance, comprising:

microparticulate beta -(1,3)-glucan with or without beta -(1,6)-glucan side chains which do not substantially reaggregate upon drying or rehydration;

at least 2% by weight partially deacetylated N-acetylglucosamine within said beta-glucan that provides a free amino group for vaccine conjugation.

14. A vaccine conjugate or conjugated antigenic substance attached to the free amino group of microparticulate beta -(1,3)-glucan, which stabilizes the vaccine and enhances the immunologic effects of vaccine, comprising:

microparticulate beta -(1,3)-glucan with or without beta -(1,6)-glucan side chains with about 1-10% by weight partially deacetylated N-acetylglucosamine within said beta-glucan that provides a free amino group for vaccine conjugation which does not substantially reaggregate upon drying or rehydration;

a vaccine or an antigenic substance, wherein said vaccine or antigenic substance is conjugated with said free amino group.

15. A method for preparing a small particle size glucan for dry packaging comprising the steps of:

obtaining a polysaccharide composition comprising the glucan;

hydrating the glucan with a liquid;

disrupting the glucan;

loading the glucan in a sprayer; and,

spraying the glucan.

16. The method of Claim 15 further comprising the steps of:

grinding the glucan and

re-hydrating the glucan whereby a portion of the glucan is dissociated into particles of about 1 - 2 microns in diameter.

17. The method of Claim 15 wherein the glucan is substantially glucan selected from the group comprising beta-(1,3)-glucan and beta-(1,6)-glucan.

18. The method of Claim 15 wherein the disrupting is accomplished by sonicating the glucan.

19. A method for preparing a small particle size glucan for improved immunological response through enhanced activation of a macrophages and freeze drying the glucan such that re-hydration of the glucan disassociates the glucan, comprising the steps of:

obtaining a polysaccharide composition comprising a glucan containing composition;

hydrating the glucan containing composition with a liquid;

disrupting the glucan;

adding a gelatin solution to the hydrated glucan; and,

freeze drying the glucan.

20. The method of Claim 19 further comprising the step of grinding the glucan.

21. The method of Claim 19 further comprising the step of rehydrating the glucan whereby a portion of the glucan is dissociated into particles of .3 - 3.0 microns in diameter.

22. The method of Claim 19, wherein the disrupting is accomplished by sonicating the glucan.

23. The method of Claim 19, wherein the glucan is substantially glucan selected from the group comprising beta-(1,3)-glucan and beta-(1,6)-glucan.